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EDITORIAL.

Tamil Land Settlements.

Few employers of Indian labour would be prepared to question the desirability of setting aside land for allotments for their labour force, for the advantage to the employer of possessing a settled and contented labour force is self-evident. It appears curious, therefore, that after the lapse of some 40 years of regular employment of Tamils, the well-organized and successful realization of this desideratum should be the exception rather than the rule. It is not our intention to point the accusing finger at any class of employer for failure in this direction, but to indicate typical successful ventures as a basis for considering the prime objects of such schemes and the manner in which such objects may be achieved.

We therefore publish an article in this number on "The Settlement of Tamil Labourers on the Land" which records the observations of various officers of the Department of Agriculture who have at different times visited these centres, coupled with the observations of the Controller of Labour, whose duties are such as to provide him with unique opportunities for constant study of the projects and whose opinions therefore carry considerable weight We would also in this place acknowledge the value of the assistance of the Co-operative Department in connexion with the Chuah Settlement, and of the managers of estates who have at all times welcomed visits and advice.

The mere statement of such acknowledgments points to one lesson to be learnt from past experience, namely, no scheme of Tamil settlement on the land in this country, be it an ambitious scheme such as that at Chuah or merely small allotments on an estate, is likely to be successful unless it is assisted by the sympathetic guidance and encouragment of some one in authority—in the Chuah Settlement it is the Co-operative Officer, on estates it must be the manager and staff. We would emphasize that the nature of this encouragement is not necessarily by the provision of funds or capital; in some cases this might in fact prove a reason for non-success of the scheme, for it is necessary to encourage the settlers to seek salvation by their own efforts rather than to expect the controlling hand to smooth out all difficulties. On the other hand, the provision of funds, especially in the initial stages of development, is in some cases justified and necessary, for one should not present a task of such magnitude as will lead to early discouragement.

In the article under reference we have dealt briefly with three types of development. Firstly, there is the settlement where the holding is the personal property of the labourer and sufficiently large to provide him with a living; secondly, a settlement in which the holdings belong to an estate and the labourers are definitely dependants of the estate, and thirdly, small allotments adjacent to the living quarters of employees on an estate. A fourth type of settlement has been advocated by a speaker recently, that is the development of specific areas of irrigable padi land to augment the food supplies of this country.

The objects of encouraging agriculture amongst Tamil labourers is to ensure a settled labour force in this country and to improve the health and economic condition of the individual. The chief difference between the more ambitious public schemes such as that at Chuah and the private schemes on estates is that an essential of the former is ultimately to give complete ownership to the settlers, whereas in the latter case, ownership of the land must be vested in the estate. The disadvantage to the Settlement of complete ownership is that the settler has the right of mortgage or sale of his property to any nationality and we visualize in this right the danger of disintegration of the Chuah Settlement.

There is a wide divergance of opinion as to the size of holding; in the instances given it varies from 4 acres at Chuah to as little as 1/16 acre on garden allotments. The guiding principle in deciding the area must depend upon the degree of independence it is intended to give to the holder. An area of 4 acres of good land will support a family, but where a small area is held the owner must augment his income by other work, while when the area is very small the outside work becomes the first consideration, the garden merely a spare-time employment.

But whether the scheme be ambitious or not, an essential of success is that the soil must be suitable for the purpose. Chuah, Permatang and Rubana are all alluvial soils, rich in comparison with inland soils. Similar attempts on the latter soils would in all probability come to grief unless adequate quantities of animal manure, or compost, were available.

The Controller of Labour has stressed the fact that the successful settlements are based on the keeping of animals. We agree with this view and would therefore suggest that all settlements other than small vegetables allotments should include adequate grazing reserves and the owners be encouraged to start by the introduction of suitable stock.

Finally, one is led to consider how far these schemes have or are likely to achieve the objects in view. With the allotment garden there can be no doubt of success, and managers have shown that they form a valuable insurance against shortage of labour, they can be run without danger to health through insanitary conditions, and that the labour has benefitted in a number of ways. In the case of the larger settlements the result is, we believe, not quite so certain. The tendency may be towards complete independence, or the settlers may only seek outside work when times are bad—when therefore the demand for labour is small. As against this, however, is the undoubted fact that the Chuah settler is fortunately placed. Many of them work daily on near-by estates, their wages from this employment

in addition to their profits from the holdings providing them with the money necessary to procure permanent titles to the land (about $60 for a 4-acre holding). Whether, when a settler has reached this independence he will be as anxious to secure outside employment remains to be seen, but it is at least probable that his children will be forced to provide for themselves, and only return to their "Malayan homesteads" when times are bad or the age of their parents necessitate that they should increase their responsibility to manage the family land.

Sexing of Chicks.

We include a short article by Mr. G. E. Mann, M.C., on the sexing of day-old chicks. Mr. Mann investigated two possibilities in which sex-linkage might occur in Canton fowls, one of which has been found to be of value with certain pure breeds, notably the Rhode Island Red.

The sexing of Canton chicks, if it could be successfully and easily accomplished, would be of great value to the local industry as there is a strong demand for pullet chicks in certain parts of the country.

The author carried out an exhaustive test of both methods with Canton chicks but, somewhat contrary to expectation, he found that they were entirely unreliable. The inclusion of these negative results in this Journal is considered justified, not only because the investigation is of interest, but so that future investigators may be saved the necessity of pursuing the same research with this breed.

Original Articles.

THE SETTLEMENT OF TAMIL LABOURERS ON THE LAND.

Introduction.

Although legislation exists in the Federated Malay States whereby estate managers are required to set aside land suitable for allotments for all labourers who have dependents, it is a regrettable fact that, for a number of reasons, well cultivated gardens exist on comparatively few estates.

A number of far-sighted managers have, however, given careful consideration to this question, and although success has not always attended efforts to organize such gardens on estates, there exist in this country a number of estates which now possess gardens or settlements of considerable merit.

It is thought that a brief account of the organization of this type of development may serve as a useful guide to managers who wish to develop spare-time agriculture on their estates. The following account goes a little further than this, for it attempts to outline the three types of schemes met with in this country, which are designed to settle Tamil labour on the land either permanently or temporarily with the idea of conserving the labour force in Malaya, improving their conditions of food and living, and assisting them during periods when there is little demand for labour.

The following account, therefore, touches on three different aspects of this subject, *viz.*: (i) Tamil Settlements, where the labourers are owners of their land—such as the Chuah Tamil Settlement and the Bagan Serai Settlement; (ii) Tamil Settlements in which the labourers do not own the land, but are semi-independent of the owners; (iii) Allotment gardens on estates.

THE CHUAH TAMIL SETTLEMENT.

The Chuah Tamil Settlement is 4 miles from the village of Chuah in the Port Dickson District of Negri Sembilan. It consists of 243 acres which were given out in 1932 to Indian settlers—all of whom had been in Malaya for about 20 years—on Temporary Occupation Licence in the first instance, with the proviso that permanent titles would be granted when the owners had paid the premiums, survey fees and rent. The fees are stated to be $10 per acre with an annual quit rent of $2 per acre and the title stipulates that no rubber trees may be cultivated. A remission of two-thirds of the survey fees, which amount to about $20 per 4-acre plot was agreed to by Government. Of the 69 settlers, 39 hold 4 acres each, 14 have three acres each and 16 have 2 acres each.

Nature of the Land.

The land consists of a flat coastal plain comprising alluvial deposits of clay intermixed with a certain amount of peat; the latter, however, is not present in sufficient quantity to result in the lowering of levels due to weathering.

The organization of the settlers has been in the hands of the Co-operative Department, through the Indian Co-operative Officer, Negri Sembilan (Mr. Thaver).

The object was to settle on the land a number of Tamil labourers who were at that time out of work. The scheme provided that the land should be granted in the first instance to a group of settlers and not to the individual members of the group. This group was given legal status by being registered as a Co-operative Society, and it was a condition of admission that only selected settlers should join the Society and they should act in accordance with the orders of the Committee. Failure to do so entailed expulsion from the Settlement. In this connexion it must be remembered that the settlers were without capital and without knowledge of the work which confronted them. The initial capital came from the sale of jewellery, goats and cattle and no financial assistance was given by Government. The advantage of this communal work was soon apparent; the whole area was felled at one time, and adequate drainage carried out at an early date. Once the felling was done, temporary structures were erected of bark and jungle wood and the settlers started to house themselves.

It has since been found that improvement works affecting the whole settlement are best undertaken on contract and the system is, after a contract price has been settled, to raise the money by a levy on the holdings and to stipulate that the contractor shall employ the settlers on the work; thus they are able to obtain a refund of portion of their contributions depending on the amount of work performed on the scheme.

The risk of disease, and in particular of malaria, was considerable. The Health authorities made a close survey of the area and gave advice as to the preventative measures to be adopted. These measures have been carried out under the supervision of the Society and there has been very little ill-health in the Settlement since its foundation. Periodical visits are paid by officers of the Medical Department, while from time to time the advice and assistance of other departments, in particular the Department of Agriculture and the Drainage and Irrigation Department, has been obtained.

More recently, a school and a temple have been built, and areas set aside for a grazing reserve and a burial ground.

Cultivation.

The area was well cleared and there are now but few logs and stumps.

The first cultivation mainly comprised padi and ragi; both crops showed vigorous growth, but ultimately suffered severe rat damage.

At the present time the settlers concentrate on pig keeping and there are said to be nearly 700 pigs on the Settlement, besides over 200 goats and a number of poultry. Poultry are less in evidence than formerly, stated to be due to a recent epidemic disease which resulted in many deaths. Practically the whole cultivated area is planted either with tapioca or sweet potatoes. These crops are used either for feeding the owners' pigs or are sold to neighbouring Chinese pig

keepers. A few fruit trees are found around homesteads, but no steps have been taken to devise a rotation of crops to conserve the fertility of the land and to augment the food of the people by the inclusion of crops such as maize, ragi and green vegetables.

The pigs are kept in sheds with slatted floors raised one or two feet above ground. The ground under the floor is invariably filthy and no adequate arrangements are made to collect and store the urine and dung for use on the land. Under these conditions the wells from which water is drawn for drinking and washing the pigs is in danger of contamination. It is stated, however, that the general condition and health of the pigs is good.

While some of the owners maintain their own pig sties and herds, others have amalgamated so that the sties are very large and labour is kept continually in attendance in looking after the stock. This appears to be a good system as the animals are given closer attention than would otherwise be the case, for at the present time a number of the settlers are employed on near-by estates and consequently can give attention to their own holdings only in the late afternoons. The stock is fed on the tapioca and sweet potato crops grown on the Settlement, supplemented by rice bran and "ikan busok" (fish waste).

The goats, which are healthy and in good condition, are housed in raised sheds and are given restricted exercise and are fed mostly on tapioca leaves and tops.

Economic Position of the Settlers.

The present system of agriculture adopted is evidently devised to produce a fair return from the land with the minimum of work. Such a policy is dictated by the present ability of the holders considerably to augment their incomes by work on estates in the vicinity. It might well be that a falling-off in the demand for labour would see the owners spend more time on their land, and therefore producing a wider range of crops than at present. The ever-present danger of having "all the eggs in one basket" is seen at the present time, for a recent fall in the price of pigs has materially affected the settlers. The continual cropping of the land with tapioca and sweet potatoes will lead to greatly reduced crops and therefore smaller profits from the pig industry. The soil, however, appears to be good, and should the need arise a wider range of crops could be grown on the land. In the meantime, consideration should be given to devising a rotation of crops which will ensure the food supply to the pigs and goats and conserve the soil, coupled with the manuring of the land with the dung from the sties.

SETTLEMENT AT BAGAN SERAI, PERAK.

A few Tamil Settlements have been established at different times and under various conditions, some of which have proved successful for a time and have then deteriorated, but in a few instances a considerable measure of success has resulted. Pride of place must be given to a successful Tamil Settlement at Bagan Serai in

Perak which is in charge of a resident priest of the Roman Catholic Mission. The Controller of Labour, Malaya, in his Annual Report for 1937 comments on this Settlement as follows:— "It was founded about 53 years ago and all the settlers living in it have been born in Malaya and have never visited India. The settlement owns about 700 acres of land and has a population of about 400. The original families were each given 5 acres of land as their own property on which to live and plant padi and as others arrived they were given the same concession. The majority lead a life exactly as in India. They till their land and only when in need of ready cash do they seek work elsewhere and then only for a limited period."

PERMATANG ESTATE SETTLEMENT.

The Permatang Estate Settlement is owned by Permatang Estate, Morib, Selangor, an estate devoted to the cultivation of coconuts and rubber. The Directors of the Estate have set aside an area of 63 acres of land for the benefit of their labourers. As the Controller of Labour states:—"The scheme was started in November, 1936, with the idea of getting a number of non-working dependent labourers to take up blocks of land and contribute something to the exchequer instead of loafing about the lines and being a drag on their relatives. It was hoped that some of the older workers would also take up land with a view to developing it in their spare time and retiring to live on it when they were no longer fit for work.....The area is divided into one acre blocks, 5 chains by 2 chains, the dividing lines being 3-feet drains. Each block is therefore adequately drained and there are no disputes about encroachment of one settler on the land of another."

"A small annual quit-rent of 25 cents is paid for a holding of 1 acre, and while all clearing and drainage is done by the estate, labourers are expected to use their own initiative as regards cultivation and maintenance of the holdings. Thus, except for an attap roof provided by the estate, labourers must build their own houses, and it is estimated that these cost anything from $10 to $15 each."

At first there was great reluctance to take up the land, but once this initial difficulty had been overcome by confidence that there was no hidden reason behind the offer of the estate, land was taken by the settlers, till at present 30 acres have been opened up and 5 acres put down as a grazing reserve. The population consists of 23 men, 21 women and 33 children.

Development of the Land.

Considering the short time that the settlers have been in possession of the land, considerable development has been achieved. Each holder possesses pigs and goats and cultivates his land with a number of food crops—mostly vegetables, besides tapioca and sweet potatoes for his own consumption and for feeding to his stock. The Estate has assisted by the provision of a nucleus of the stock for each holding, and has also found it necessary to arrange for the sale of pigs when ready for market to prevent the owners being exploited by the local buyers. When the

Settlement started poultry was kept, but the owners found it impossible to allow free range for the poultry because of the damage they did to the crops. By mutual consent, therefore, they have abandoned poultry-keeping.

This Settlement is as yet in its infancy, but with the aid of the sympathy and care of the Manager, it holds promise of considerable success.

LABOUR ALLOTMENT GARDENS ON RUBANA ESTATE

Probably the main factors influencing the success, or otherwise, of allotment gardens are firstly, the accessibility of the land set aside for this purpose and its distance from the labourers' quarters; secondly, the attitude of the employer towards the cultivation of these gardens and, lastly, the failure of individual labourers to take an interest in the scheme when, as frequently happens, no attempt is made to allot a prescribed area to each man. In this connexion it is interesting to note that, in recent years, labourers' gardens have been successfully established on a number of estates and the allotments on Rubana Estate, Lower Perak, are typical of the successful organization of such gardens.

Layout.

A long strip of flat land some 100 yards wide has been set aside for labourers' quarters. This is bordered on one side by rubber and a small patch of coconut palms and, on the other, by a cycling path and a light railway.

The quarters are of the cottage type and each family lives in a semi-detached building at ground level. Each unit consists of five detached buildings in a row representing ten semi-detached cottages.

The gardens, each 70 feet by 30 feet, adjoin the quarters and they are fenced off from each other by wire netting.

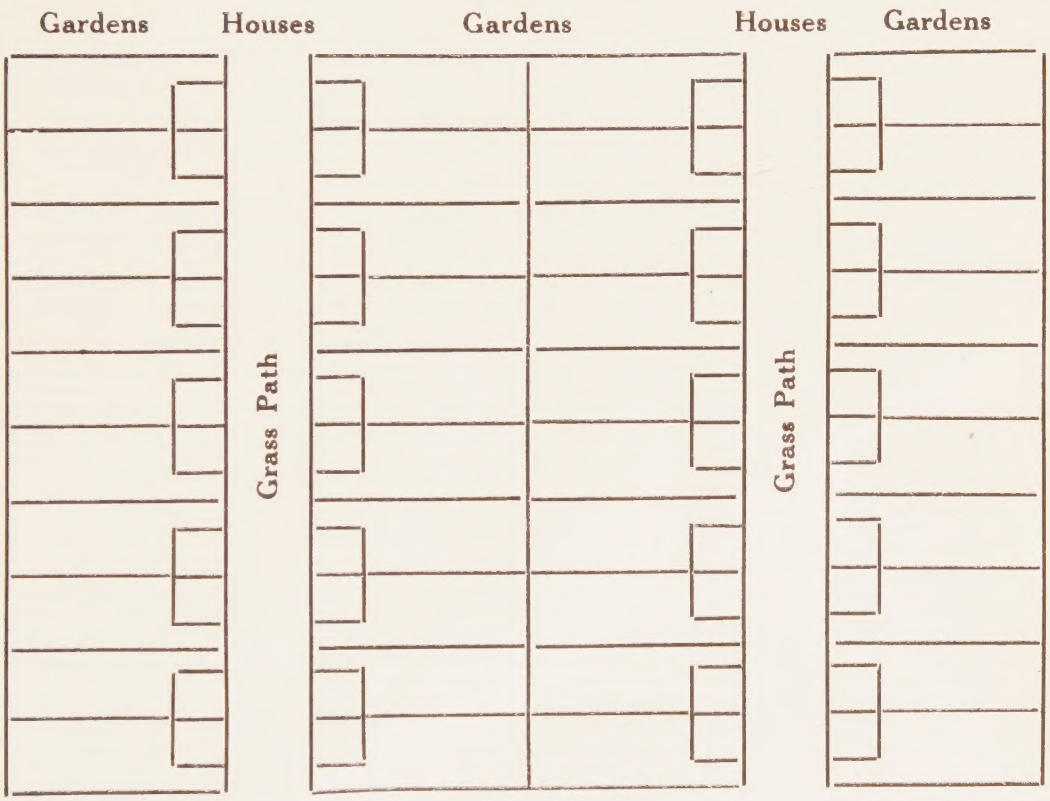
The pairs of units are so arranged that the gardens adjoin each other, while the houses are separated by a wide grass path with shade trees planted down the middle. On either side of this path shallow concrete drains have been constructed which keep the house sites dry in the wettest of weather. There is no permanent system of drainage for the gardens apart from the deep main drain which borders the rubber land, but small scupper-drains have been dug by individual labourers.

At the present time there are 94 occupied, semi-detached cottages with a corresponding number of gardens cultivated. In addition, it is anticipated that a further 48 families will be provided with similar new quarters by the end of June, 1939.

Cultivation and Bed Formation.

The gardens are hand-cultivated by "chankol" and there is a tendency to produce too coarse a tilth. However, with experience, the labourers should be able to envolve a system of trenching whereby the top layer of soil is not mixed with the subsoil. Similarly the methods of bed formation are not entirely satisfactory and the typical raised bed, some 4 feet wide, as constructed by Chinese market gardeners might well be used as a model for future development.

PLAN SHOWING LAYOUT OF GARDENS ON RUBANA ESTATE.



Manuring and Rotation of Crops.

The soil is a typical, moderately-fertile, alluvial clay which requires, for the growth of vegetables, some sort of organic manure to improve aeration and tilth. Fortunately there is sufficient cattle and goat manure available on the estate for the gardens and it is therefore possible to maintain the fertility of the land at a high level and, at the same time, to crop it intensively. In no case is any rotation of crops followed intentionally since, as in most gardens cultivated by Indians, different varieties are planted in a somewhat haphazard fashion. However, the proportion of leguminous crops grown is high and the general health satisfactory so it is possible that some unintentional rotation is in force.

General.

It is very noticeable that the labourers take a personal pride in the cultivation of their allotments. Furthermore, the proximity of each garden to the owner's quarters and the fact that each one is fenced reduces petty pilfering to negligible proportions.

Animal manure has always been available to the labourers and, recently, seed of improved or new varieties of vegetables has been distributed. Interest in gardening has been further stimulated by the recent establishment of a school garden alongside the estate school. This is being used for demonstrating correct methods of cultivation and bed formation to the children. In addition, it is also intended to use a garden attached to one of the new cottages for demonstration purposes. This consists of two series of raised beds divided by a central path running from the house to the boundary fence. All the work will be done by the labour force, under supervision, and the beds will be cropped according to a simple rotation.

It is considered that the amenities offered by the association of cottage lines and individual allotments are such that the extra cost of these quarters over the more normal type of lines and garden-reserves is more than counterbalanced by the efficient work performed by a healthy and contented labour force. In addition to the improved diet which ensues it is estimated that the produce from an average garden is worth some $2 per month to the labourer.

It is not so many years ago that labour employers were reluctant to spend any great sums on mosquito control: to-day this constitutes a very large item on the balance sheet as it has been shown that such expenditure is actually a saving. Similarly it seems safe to prophesy that, in the near future, more and more employers will realize that any project which substitutes a well balanced diet for the usual curry-and-rice of Indian labourers is likely to pay for itself in a short while.

INVESTIGATIONS ON THE SEXING OF DAY-OLD CANTON CHICKS

BY

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Introduction.

The local trade in day-old chicks is considerable. Thus, in Singapore alone, the Agricultural Officer reports that there are 12 Chinese hatcheries with a combined output of about 250,000 chicks a month. The market price is usually about 5 cents each (unsexed) but the Agricultural Officer has ascertained that Chinese poultry farmers would be prepared to pay up to 7 cents each for pullet chicks. Any method of sexing day-old chicks would therefore be of more than academic interest in Malaya provided it was simple and reliable.

Methods of Sexing.

In Europe and America, where sexing is of great importance, two methods are commonly employed:

(*a*) The so-called "Japanese" method, first published in 1933, depending on an examination of the rudimentary copulatory organ. The method requires considerable skill and throws a great strain on the eyes. It is not employed in Malaya at present.

(*b*) A group of methods depending on the sex-linkage of certain hereditary characters. With the exception of two pure-breeds, it is necessary to cross certain selected pure-breeds for this purpose and the methods are not capable of widespread application in Malaya at present.

In 1935, Byerly* observed sexual dimorphism in the down-colour of day-old Rhode Island Reds in America. The chicks were divided into two groups, one having spots and/or stripes of melanic pigment on the head and/or back, the other being devoid of this pigment. Of 1102 chicks and embryos examined, 84.9 per cent. of the "spots and/or stripes" were female while 77.8 per cent. of the "non-spots' were male. Emphasis has since been laid on the necessity for black pigment, not red or any other colour.

Observations on Rhode Island Reds were begun at the School of Agriculture, Serdang, in April 1938. Only 167 chicks have so far been examined but about 70 per cent. accuracy in sexing has been obtained, which agrees fairly well with Byerly's results.

In other words, it is possible to separate R.I.R. chicks into two groups, one of which is preponderantly male and the other preponderantly female. The method is simple and is of definite value where other methods are not available, provided that a fairly large number of chicks (say 50 to 100) is involved on each occasion.

* *Poultry Science*, Vol. XVI, No. 6.

The presence or absence of spots and/or stripes of melanic pigment has since been observed by the writer both in R.I.R. x Canton chicks at Serdang and in Canton chicks at the Chinese hatcheries in Singapore. In both cases, where the pigment does occur it is more prominent than in the case of Rhode Island Reds. A fair proportion (but not all) of the chicks at these hatcheries are of the Canton type.

Investigations and Results.

The writer visited Singapore to investigate the possibility of sexing day-old Canton chicks as sold by the Chinese hatcheries. It was then learnt that the Chinese claim to be able to sex day-old chicks by the colour of the beak. The upper mandible is usually pink or slate-grey and terminates in a light pink or yellow point. Where two distinct colours occur, separated by a definite margin, the sex is alleged to be female; where only one colour is present, or where one colour shades gradually into another, the sex is alleged to be male. It was decided to investigate both methods simultaneously.

A total of 590 chicks of the Canton type was purchased from various hatcheries, half having black spots and/or stripes and half having no melanic pigment. Each group was killed by suffocation with coal gas, opened for post mortem examination, and the beak colour and true sex were then recorded.

Of 295 chicks without spots or stripes, 184 (62.7 per cent.) proved to be males. 140 out of 295 chicks with spots and/or stripes (47.5 per cent.) were females. Of the 590 chicks examined, 339 were males of which 184 (54.3 per cent) were accurately forecast; while of the 251 females, 141 (56.2 per cent.) were accurately forecast.

As regards beak-colour, there were 220 chicks with one-coloured beaks of which 114 (51.8 per cent.) were males; and of 370 with two-coloured beaks 144 (38.9 per cent.) were females. 114 of the 339 males (33.6 per cent.) and 144 of the 251 females (57.4 per cent) were accurately forecast.

Conclusion.

The results indicate that both "methods" are futile so far as Canton chicks are concerned. Similar results could have been obtained by dividing the chicks into two groups without any preliminary selection at all, calling one group male and the other female. The pigmentation of down and beak is interesting but is clearly not sex-linked.

Acknowledgments.

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A ROOT DISEASE OF THE DURIAN TREE CAUSED BY *PYTHIUM COMPLECTENS* BRAUN.

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Introduction.

In 1934 the writer (1) recorded the presence of an infectious and fatal disease of the durian tree (*Durio zibethinus*) in Penang. This disease occurred in the form of "patch canker" of the bark of the main stem and was due to attack by the fungus *Phytophthora palmivora*. The fungus gradually killed affected trees by extending in the basal bark tissues until the stem was ringed. The trouble did not originate in the roots, and external signs of the presence of patch canker could be discovered in time to apply curative treatment and to save valuable trees from death.

In March, 1938, a number of durian trees, in a small fruit estate in Singapore, died and it was found that a root disease caused by the fungus *Pythium complectens* was responsible for the trouble on this occasion.

Field Observations.

The disease was first noticed when the branches of certain trees began to die back with the production of new shoots from the main branches below the "die-back" portion. About 50 trees were affected, both in groups and singly, and a number of them died out completely shortly afterwards. (Plate 1).

The bark of badly affected trees was brown and decayed at, and just above, soil level but definite symptoms of patch canker were lacking.

In a typical early case the upper lateral roots were healthy but the lower laterals, on one side, were affected by a decay extending from the tips along the cortex and wood to the tap root which had descended to about 4 feet (Plate 2).

In more advanced cases the decay had extended to the tap root and had begun to travel upwards to "ring" the cortical tissue at the collar. The affected roots were not disintegrated and, externally, appeared to be normal. Beneath the epidermis, however, the cortical tissue was dark brown and the wood, which was rather dry and soft, was of a pinkish colour flecked with brown.

The area—about 15 acres— had been planted with durian seedlings eight years previously. These had made fair growth and the trees were about 15 feet in height, and were in bearing at the time the disease appeared. The soil, a medium textured, yellow quartzite, had suffered from erosion as the ground slopes fairly steeply and the area had been clean weeded. The sub-soil is gravelly with signs of lateritic material at a depth of $3\frac{1}{2}$ to 4 feet but there is no distinct "pan" at that depth.

The area is naturally well drained and when the trees were opened up for examination the soil was comparatively dry and is not of a type which would become waterlogged or excessively damp through lack of porosity, but it contains little organic matter, is poorly aerated and not very fertile.

Isolations.

Cultures were established from the margin of diseased and healthy root tissue, from decaying roots, from the tap root and from the decayed areas of the stem near the base.

Pythium complectens was isolated from the root tissue, in some instances as a pure culture, but not from the stem.

Diplodia sp. was present as a secondary fungus in decayed root tissue and this fungus was also obtained along with *Fusarium* sp. from the decayed basal stem tissue.

The Fungus.

Pythium complectens was originally described by Braun (6) as parasitic on cuttings of Coleus and Pelargonium in the United States of America. The fungus has also been recorded in Malaya by the writer (2) as a cause of "Patch Canker" and "Pod-rot" of the rubber tree; on lowland tea seed-bearers growing in badly drained, heavy soil where the fungus was associated with *Sphærostilbe repens* in a fatal root disease (3); on tea seed-bearers at Cameron Highlands (*loc. cit.*) where the fungus was present in the wood of the stem of trees attacked by *Ustulina zonata;* on carnation at Cameron Highlands associated with *Fusarium* sp. in a wilt; on oil palm from decaying bud tissue of a palm injured by lightning (4).

Sharples (5) has described the association of the fungus with cases of root and collar patch canker of rubber trees injured by lightning.

In culture, on agar media, the fungus forms large numbers of oospores. Sporangia are not numerous on media, in this country, but develop in water cultures and germinate either directly or by extrusion of zoospores in the manner characteristic of the genus Pythium. The oogonia of the durian strain are spherical and range from 14-24 microns with a mean diameter of 18 microns; the oospores average 16 microns, are smooth and may have a yellow wall. The sporangia are spherical and have a mean diameter of 21.5 microns.

Inoculations.

Diplodia and Fusarium had no effect on the tissue of healthy trees when inoculated into the bark but *Pythium complectens* was found to be parasitic. Details are given below.

Seedlings. Two durian seedlings, about 14 inches high, and growing in bamboo joints, were inoculated by placing portions of a pure culture of Pythium on to wounds in the bark of the stem at soil level and in the tap root. The inocula-

Durian trees attacked by root disease in the affected area at Singapore.

A diseased root of durian showing the decay advancing towards the tap root.

tions were kept moist. The results were negative after a month, when the seedlings were removed and examined.

Two seedlings were not wounded but were inoculated in the same way. After a month one was removed and examined and found to be healthy. The other was retained and was again inoculated on several occasions during the next six months. One month after the last inoculation it wilted and died. The root system was decayed and the plant had become "pot bound". *Pythium complectens* was isolated from the tap root, along with *Diplodia* sp. and bacteria.

Trees. The stems of two tall, healthy durian trees were wounded, inoculated with Pythium and kept moist with cotton wool covered with cellophane. After 10 days a patch of decay 6 inches long and 2 inches wide had formed in the cortex and cambium above the inoculation and the fungus had penetrated $\frac{1}{4}$ inch into the wood in the case of one tree inoculated during dry weather; a patch 12 x 2 inches and $\frac{1}{2}$ inch deep in the wood had formed in the case of the other tree inoculated during wet weather. The fungus was re-isolated from cortex and wood in both cases.

Inoculations without wounding the bark gave no results.

Inoculations with and without wounds on the roots of these trees were also successful, but the fungus advanced more slowly in the tissues. It was found difficult to avoid wounding the roots when exposing them and the finer feeding roots were injured in the case of the "unwounded" inoculations.

After 3 weeks the fungus had advanced about 2 inches into cortex and wood towards the tap root in the case of wound inoculations and had penetrated into the cortex of the "unwounded" roots. *P. complectens* was re-isolated.

A similar result was obtained by inoculating the roots of a stunted, 15-year old durian tree.

In order to avoid root disturbance, holes 1 foot deep were made with a stick around the base of a healthy durian tree and a suspension of zoospores was poured in. A plug of culture medium on which *P. complectens* was growing was then inserted into each hole and bricks were placed over the openings. Three months later the roots were examined but no trace of disease was found.

The fungus had no effect on wounded bark of a rubber tree (*Hevea brasiliensis*) and failed to attack the heart leaves of pineapple plants.

Discussion.

In general, species of the genus Pythium operate as parasites more effectively under conditions of excessive moisture and humidity, as for example in the "damping off" of seedlings which can be checked by promoting drier conditions.

It appears, however, that the species isolated from the disease of durians can operate under comparatively dry conditions, although it appears to extend more rapidly in the stem tissues during wet weather.

The results of inoculations of the stem of durian trees indicate that the fungus is a wound parasite which could operate in a manner similar to that of *Phytophthora palmivora* to cause "patch canker" of durian.

In view of the occurrence of a strain of this species in the roots and at the collar of rubber trees injured by lightning, the possibility that the attack by the fungus on the roots of the durian trees at Singapore followed injury to the affected trees, by lightning, was considered. A careful search of the area, however, gave no indication that lightning injury had occurred.

The root inoculations mentioned above indicate that the fungus is a facultative parasite of the roots of durian. It is probable, in the case of the successful inoculations, that the resistance of the inoculated roots was lowered by the inevitable disturbance of the soil and injury to the feeding roots when making the inoculations.

The fungus extended in the root tissue rather slowly in comparison with its rapid extension in stem tissue and failed to attack vigorous young seedlings, or the roots of a healthy tree exposed to infection by inoculation under conditions of minimum root injury, but appeared to have killed a young seedling when the roots became pot bound.

It is probable that the incidence of the disease in the area at Singapore is influenced by the present condition of the soil in the area which, as mentioned above, has not been protected from erosion since the trees were first planted.

It is considered that, in the present instance, *Pythium complectens* is responsible for the death of the durian trees, and that the fungus is acting as a facultative parasite of the roots of trees growing in soil which has declined in fertility.

Recommendations.

As a precautionary measure it was recommended that diseased and dead trees be uprooted and burnt, lateral roots extracted and infected areas isolated by trenches in the manner usually adopted in dealing with root diseases. Inspection of the lateral roots of trees, adjacent to diseased trees, should be carried out and cut ends of roots protected with a wound dressing.

When the diseased material has been removed from the isolated patches, cattle manure, compost or organic matter can with benefit be incorporated with the soil when filling in the trenches before replanting.

The question of manuring the remaining trees should be given consideration and efforts to recondition the soil, and to prevent further erosion, should be made.

Summary.

1. A root disease of durian trees, growing in poor soil, is described.

2. The fungus *Pythium complectens* Braun. was isolated from the diseased roots and shown, by inoculation, to be a wound parasite capable of causing patch canker of the stem and to function probably as a facultative parasite of the roots.

3. In addition to adopting the usual methods for treatment of root disease of trees it is suggested that manuring, reconditioning the soil and prevention of erosion should also be undertaken.

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CONDITIONS ON RUBBER SMALL HOLDINGS IN MALAYA

3rd Quarter, 1938.

Prepared by the Economics Branch of the Department of Agriculture, S.S. and F.M.S., in collaboration with the Field Branch of the Department.

Rainfall.

During July and the first half of August very dry weather was experienced throughout the country. The latter half of August brought heavy rain, causing floods in Province Wellesley and Kedah, the seriousness of which in Kedah was enhanced by the Spring tides. September was wet throughout the country, in many places the rainfall being above average for this time of year, except in Malacca where dry weather was experienced. Pahang, however, experienced hot and dry weather throughout the quarter, with total rainfall for the most part below average.

Prices and Production.

Prices paid for small-holders' rubber are summarized in Tables I and II, which show the extremes and means of prices recorded at a number of centres in each State.

The price of rubber showed an upward trend throughout the quarter which was more pronounced in July and August than in September. This rise is ascribed in large measure to the reduced quota. The grave international situation at the end of the quarter caused a sharp drop in price, but on more favourable news from Europe the market recovered rapidly.

The actual price of rubber without coupons showed little variation during the quarter, the rise in price, in fact, being a rise only in the price of coupons. Coupons, at the end of the quarter, were around $26 per picul equivalent, and rubber without coupons at about $6 to $7 per picul.

Production of rubber on small holdings during the quarter is shown in Table III, which is prepared from the monthly reports of production, stocks, imports and exports of rubber published by the Registrar-General of Statistics, S.S. and F.M.S.

Quality of Rubber.

Efforts to improve the quality of rubber in Perak appear to be meeting with but little success. Many smoke cabinets are now out of use, while the introduction of a grading scheme in one area has merely resulted in greater interest in advisory work but has resulted in little change in established methods. At a meeting of the Lower Perak Rubber Supervision and Advisory Board it was decided

Table I.

Highest and Lowest Rubber Prices Paid by Local Rubber Dealers.

(In Straits dollars per picul of 133 1/3 lbs.)

3rd Quarter 1938.

	Penang	Perak	Selangor	Negri Sembilan	Pahang	Malacca	Kedah	Johore
				JULY				
Smoked sheet	32.00-28.00	33.00-29.00	32.50-27.00	32.55-27.80	33.00-23.00	33.00-26.50	34.00-29.00	32.25-25.00
Unsmoked sheet	32.50-27.00	30.50-27.00	30.00-25.00	31.00-21.00	31.00-26.00	31.00-28.50	32.00-25.00	30.00-24.00
Scrap	26.00-19.00	20.00-18.00	19.50-16.00	—	—	26.00-20.00	28.00-22.00	26.00-18.00
				AUGUST				
Smoked sheet	35.00-31.00	34.50-31.00	34.70-30.00	34.00-30.00	35.50-30.00	35.50-30.00	36.00-31.80	34.50-26.50
Unsmoked sheet	34.00-30.00	33.00-27.00	31.00-28.00	33.00-25.00	31.60-29.00	34.00-29.00	35.00-27.80	32.75-25.00
Scrap	29.00-20.00	24.00-20.00	19.50-16.00	—	—	27.00-24.00	29.00-21.00	27.40-24.00
				SEPTEMBER				
Smoked sheet	35.00-31.00	34.20-24.00	34.00-28.70	34.00-25.25	34.60-28.50	33.50-30.00	34.00-30.00	34.50-27.25
Unsmoked sheet	34.00-25.00	33.00-22.00	32.00-28.00	33.00-24.00	31.20-29.00	31.50-30.00	31.50-26.50	32.75-26.00
Scrap	29.00-20.00	26.00-24.00	28.00-25.50	—	—	27.50-25.00	29.50-21.00	29.50-25.00

Table II.

Mean of Highest and Lowest Rubber Prices Paid by Local Dealers at a number of Centres in each State.

(In Straits dollars per picul of 133 1/3 lbs.)

3rd Quarter 1938.

	Penang	Perak	Selangor	Negri Sembilan	Pahang	Malacca	Kedah	Johore
				JULY				
Smoked sheet	31.25-29.25	30.78-27.79	31.65-29.58	32.27-28.70	30.80-27.75	30.50-29.67	32.75-30.00	29.91-27.55
Unsmoked sheet	31.33-28.50	29.12-25.64	29.58-27.42	30.40-25.40	29.12-26.87	29.00-27.83	30.75-21.87	28.81-26.56
Scrap	24.00-21.57	20.00-18.00	19.50-16.00	—	—	24.33-23.17	26.50-23.50	24.98-22.83
				AUGUST				
Smoked sheet	34.50-32.00	32.20-31.19	32.82-31.34	33.46-31.34	33.33-30.38	34.00-32.17	35.12-32.57	32.41-30.30
Unsmoked sheet	33.25-31.13	31.50-29.05	30.98-29.53	31.70-28.30	30.77-29.10	32.50-30.50	32.87-30.20	31.20-28.75
Scrap	26.75-24.75	24.00-20.00	19.50-16.00	—	—	26.17-24.83	28.50-25.83*	26.41-25.33
				SEPTEMBER				
Smoked sheet	34.75-32.25	32.81-29.82	32.78-30.28	33.70-29.05	32.90-30.22	33.33-31.33	33.25-31.10	32.18-30.22
Unsmoked sheet	33.75-29.88	30.28-27.85	30.67-29.00	31.80-28.20	30.30-29.00	31.50-30.33	30.50-27.87	31.01-29.07
Scrap	27.50-23.63	26.00-24.00	28.00-25.50	—	—	27.00-25.83	27.87-24.50	27.50-26.40

*Not including one District where for scrap the very low price of $15 to $12 per picul was paid.

Table III.

Production of Rubber on Small Holdings.

(in tons)

	Total first 3 Quarters 1937	1st Quarter 1938	2nd Quarter 1938	3rd Quarter 1938	Total first 3 Quarters 1938
Federated Malay States ...	65,992	17,967	15,683	10,591	44,241
Unfederated Malay States ...	59,324	16,749	14,039	10,639	41,427
Straits Settlements ...	12,694	3,298	2,759	1,894	7,951
TOTAL MALAYA ...	138,010	38,014	32,481	23,124	93,619

to introduce at the beginning of 1939 a grading scheme based on the standard price at Singapore and the Teluk Anson exporters' grades. Experiments in commercial grading are being continued in Pahang.

In other parts of the country the position regarding grades of rubber prepared calls for no comment.

General Condition of Holdings.

From most States reports are received of improvements in the condition of small holdings, either by terracing, silt-pitting, general clearing up, or slashing the undergrowth, but there is no general inclination of small holders to effect improvements. It must be remembered, however, that a great number of holdings —especially those owned by Chinese and Indians—are in excellent condition, while the presence of undergrowth, slashed on occasions, on many other holdings is probably more of an advantage than otherwise, as it protects the soil from erosion. In some States a steady improvement is recorded. While undoubtedly there are extensive areas which are in a bad state, generally speaking, the present position cannot be considered as unsatisfactory, and owners certainly now give this subject greater consideration than was formerly the case.

Planting.

A few cases of replanting with budded material have been reported, but the total area is insignificant.

The position concerning new planting under the International Rubber Regulation Scheme calls for some comment. Small holders receive their rights for new planting in the form of share certificates, each share giving the right to plant

Table IV.

Estimated Acreage of Tappable Rubber which was out of Tapping on Holdings of less than 100 Acres at the end of September, 1938.

PERAK				SELANGOR				NEGRI SEMBILAN				PAHANG			
District	Total Tappable area	Total area untapped	Percentage	District	Total Tappable area	Total area untapped	Percentage	District	Total Tappable area	Total area untapped	Percentage	District	Total Tappable area	Total area untapped	Percentage
Batang Padang	39,187	8,700	24	Klang	16,143	9,090	56	Seremban	23,639	19,900	84	Raub	10,534	3,500	33
Kinta	38,874	5,800	15	Kuala Langat	23,831	8,100	34	Tampin	21,856	17,700	81	Kuala Lipis	15,457	3,600	23
Kuala Kangsar	92,166	56,000	61	Ulu Langat	45,012	16,200	36	Kuala Pilah	31,832	15,000	47	Bentong	12,224	7,700	63
Upper Perak	15,590	7,500	48	Ulu Selangor	31,463	11,000	35	Jelebu	9,097	3,500	38	Other Districts†	40,373	18,000	39
Larut & Selam	43,132	4,700	11	Kuala Lumpur	20,277	14,600	72	Port Dickson	11,133	8,900	80				
Krian	9,408	7,900	84	Kuala Selangor†	8,417	3,600	43								
Lower Perak*	26,735	16,300	40												
Dindings	9,873	7,600	77												
	271,965	114,500	40		145,193	62,500	43		97,597	65,000	65		84,588	32,800	39

MALACCA				PENANG & P. WELLESLEY				SINGAPORE			
District	Total Tappable area	Total area untapped	Percentage	District	Total Tappable area	Total area untapped	Percentage	District	Total Tappable area	Total area untapped	Percentage
Central	14,093	8,300	59	North	3,549	600	18	Singapore	20,115	800	4
Alor Gajah	30,838	15,400	50	Central	10,785	4,300	40				
Jasin	25,286	5,300	21	South	8,936	7,100	79				
				Penang	15,822	1,300	8				
	70,217	28,700	41		39,092	13,300	34		20,115	800	4

JOHORE	350,007	80,500	23
KEDAH	102,126	27,600	27
PERLIS	2,916		
KELANTAN & ‡ TRENGGANU	49,133 / 29,836	29,500	36

The percentage of areas out of tapping in June, 1938, was as follows:—Perak 38, Selangor 42, Negri Sembilan 63, Pahang 21, Malacca 28, Penang and Province Wellesley 32, Singapore 2, Johore 26, Kedah 29.

* Estimated from percentage for Kuala Kangsar.

†Estimated from percentage for other Districts in the State.

‡Estimated from percentage for rest of Malaya.

1/20th acre of rubber trees. On receipt of their certificates, many small holders disposed of them to rubber dealers at prices ranging from 60 cents to $1.30 per share. The price then dropped but of late shows a tendency to rise.

Despite the widespread disposal of share certificates, small holders in many areas are engaged in using their shares to increase their area under this crop. In Selangor and Pahang there has been enquiry for available land for rubber planting, and in the latter State a number of Malays are purchasing share certificates from dealers, for it appears that on issue they were not very clear as to the nature of the certificates and sold them for as low a price as 60 cents per share; now the demand has increased, shares are changing hands at from 90 cents to $1.30 per share. In the more closely populated districts of Selangor shares were sold, and a large quantity of such rights is said to have been acquired by the larger estates owing reserve land.

Tapping.

There was some decrease in the area out of tapping on small holdings in Johore and Kedah, but an increase in all other States, so that at the end of the quarter it was estimated that 36 per cent. of the area of small holdings was out of tapping as compared with 33 per cent. at the end of the previous quarter. It must be remembered that in addition, many owners practice selective tapping, resting the less productive trees for an indefinite period. Many owners estimate that they can easily obtain sufficient rubber to cover their coupons by tapping for one month in the quarter.

Tables IV and V tabulate the results of the quarterly survey and provide a comparison with the previous quarter and last year.

Table V.

Comparisons of Areas of Rubber Small Holdings Out of Tapping.

	September 1937		June 1398		September 1938	
	Acres	Percentage	Acres	Percentage	Acres	Percentage
F.M.S. ...	96,100	16.0	239,300	39.9	274,800	45.9
S.S. ...	10,200	7.9	32,700	25.3	42,800	33.0
U.M.S. ...	42,800	7.9	147,600	27.6	137,600	25.7
MALAYA ...	149,100	11.7	419,600	33.2	455,200	36.0

Diseases.

The dry weather experienced during the quarter checked the incidence of Mouldy Rot disease (*Ceratostomella fimbriata*), although the wetter weather during September caused the disease to become more evident in some districts. Small holders usually appreciate the seriousness of allowing the disease to spread unchecked and the use of approved fungicides has found extended use in most parts of the country. In most villages, certain shops now stock one or more of the "white list" fungicides.

Pink Disease (*Corticium salmonicolor*) was reported to be spreading in one District of Perak on holdings with absentee owners.

Root diseases are almost invariably neglected. "White ant" control, however, is reported to receive more attention than formerly, and in one State the destruction of giant snails by the use of "Meta" has proved popular.

Economic Position of Small-Holders.

There has been little improvement in the economic position of small holders. The rise in the price of the product has tended to improve their position, but this has been largely offset by the low assessment, low quota and stationary position of the price for uncouponed rubber. The sale of new planting rights placed in their hands a little extra money, but generally speaking, owing to their lack of capital they have been unable to reap any lasting benefit from this right of planting, or from the higher prices of rubber prevailing in September.

THE PRESERVATION OF CITRUS FRUIT JUICES.*

There is an appreciable trade in the United Kingdom in the so-called citrus squashes and cordials, which are not, however, natural fruit juices, but juices which have undergone some form of manufacturing or preservative treatment. In the United States of America, and to a lesser extent in certain European countries, there is a considerable trade in fruit juices which are preserved in such a way as to retain unaltered the characteristics of a fresh fruit juice. At present, however, the public in the United Kingdom has not learned to differentiate between the orange and lemon squashes which are currently sold and fresh fruit juice.

Orange, lemon, grapefruit and lime squashes and cordials as sold in England are prepared from the juice imported, usually in chestnut-wood casks which are not infrequently specially lined. Lemon and lime juices containing relatively high percentages of citric acid are frequently imported without addition, but orange juice with a lower citric acid and higher sugar content is liable to undergo fermentation during transit and is therefore treated with a preservative, usually sulphur dioxide which is added in the form of potassium metabisulphite to the extent of 700 or 800 parts of sulphur dioxide per million. These juices are diluted to about one-third their original concentration, usually by means of a syrup containing 45 per cent. by weight of sugar; acetic acid may be added, also sometimes a flavouring, while the deep orange colour of orange squashes is obtained by adding colouring matter, usually carotene. In the squashes the pectin remains in the juice, while for clear cordials the pectin is allowed to settle and the clear supernatant juice racked off, or is obtained by filtration.

Preservation of Juices in a Fresh Condition.

Five methods have been evolved for the preservation of fruit juices without the addition of preservatives; they are:—

(*a*) Preservation of fresh fruit juice by simple storage at low temperature.
(*b*) Preservation of fruit juices by "flash pasteurisation" and canning of the product.
(*c*) Concentration of fruit juices by film evaporation under reduced pressure.
(*d*) Concentration of fruit juices by freezing.
(*e*) Treatment of fruit juices by the "Matzka" process.

Preservation of Orange Juice by Storage at Low Temperatures.

The juice is extracted either from the whole fruit by means of a high speed reamer or by a cup type press or a whirl type press, using peeled fruit. After

* Abstract of an article by H. A. Tempany, C.B.E., D.SC., F.I.C., Assistant Agricultural Adviser to the Colonial Office, and late Adviser on Agriculture, Malay States, published in the *Bulletin of the Imperial Institute*, Vol. XXXVI, No. 3, July-September 1938.

extraction the juice is run through a strainer and thence to an evacuating apparatus which removes contained air. Thereafter it is transferred direct to the containers and is stored in refrigerated rooms at temperatures which range from 32° to 42°F. It has been found that flavour and appearance are considerably affected by the methods of extraction and it is necessary to avoid the inclusion of too much essential oil and also bitter principles from the skin. The de-aeration treatment is also very important as this affects the keeping qualities of the juice. If de-aeration is omitted juices are liable to darken in colour and go off in flavour as the result of oxidation.

Preservation of Fruit Juices by Flash Pasteurisation and Canning.

The flash pasteurisation method for preserving fruit juices consists essentially in raising the temperature to 185° to 190°F. and maintaining it at that for about ten seconds; treatment in this way gives results comparable to heating to 160°F. for 30 minutes. The advantage of this method as opposed to ordinary pasteurisation is that as the juice is exposed to the high temperature for a very short period the development of the cooked flavour, which is an undesirable concomitant of heat treatment, is avoided.

As in the case of the preservation of fresh juices by cold storage the pasteurisation process must also be accompanied by de-aeration if successful results are to be obtained. It is also usual to combine with them treatment of the juice with a pectin destroying enzyme which enables the opacity of the juice to be controlled without affecting the flavour to the extent that would occur if the pectinous constituents were removed by filtration. Various enzymes of this nature are now marketed by a number of firms under different names. The enzyme is added to the juice after extraction and before de-aeration and pasteurisation, which have the effect of destroying the enzyme, and sufficient interval is allowed to enable the enzyme to perform its functions before the subsequent processes are proceeded with.

In the production of pasteurised citrus juices very careful selection of the fruit is essential and all damaged and partially decayed fruit must be rigorously excluded. The methods of extraction are liable to affect, as with cold stored juice, the flavour unfavourably. A method extensively employed is to halve the fruit mechanically and to hand-spindle the half sections over revolving burrs. Attempts have been made to crush the whole fruit in its natural state, but this method has been discontinued on account of the strong flavour imparted to the extract by the oil contained in the skin. This flavour is regarded as objectionable.

An outline is given below of a method of preparing the juice employed at an American factory which embodies the Stero-Vac process of flash pasteurisation which is claimed to be one of the most efficient for producing this type of product.

The fruit is first grated to remove the oil and then pressed whole, the juice being strained to remove seeds and pulp. The grater consists of two horizontal revolving discs about 4 ft. in diameter, covered with a stainless steel fillet, which rotate at a speed of about 100 r.p.m. and revolve in opposite directions. The fruit is thrown by centrifugal action against the fillet, which punctures the oil

cells. The fruit leaves the outside of the first revolving disc and is transferred to the second disc where the grating is continued. At the centre it drops into a continuous press consisting of two discs of stainless steel about three feet in diameter, which revolve in the same direction and come together for a short distance on one side. The whole fruit rolls from the grater into one side of this, is crushed and the juice extracted. After pressing, the crushed peel is lifted off the disc and the juice flows into a stainless steel trough which surrounds the lower disc. It then flows to a finisher which is a mechanical strainer of stainless steel. From the finisher the juice flows to the de-aeration unit which consists of a steam chest with a separating chamber and a condenser, all constructed from stainless steel. Juice flows through the pipes of the steam chest—which are surrounded by hot vapour—under a high vacuum of about 28 inches. Juice flows continuously from the extractors through the finisher and the de-aerating unit and is pumped out by a stainless steel vacuum pump to the can filler, which is so constructed that the juice may be broken to atmospheric pressure in an inert gas such as nitrogen.

For packing grape fruit juice plain tin cans are used, but with orange juice lacquered cans are employed in order to avoid flavour changes. After filling the juice in the cans. it is flash pasteurised by the Stero-Vac process. This process involves heating by steam injection through a patented valve in the end of each can and is performed on a specially designed machine. As the can is removed from the machine the disc in the valve is snapped into place as the result of the change in pressure; it is subsequently sealed by clinching and the cans rapidly cooled. The essential features of the process are quick heating and quick cooling combined with the removal of dissolved air.

Concentration of Fruit Juices in Vacuo.

There has been a not inconsiderable development of the concentration of fruit juices in vacuo in recent years. The principle employed is that of film evaporation which has been commercially developed in a variety of industries in the Kestner type of evaporators. The advantage of the process is that as evaporation takes place from the surface of a thin film it proceeds very rapidly while the high vacuum under which it is performed permits of the employment of a relatively low temperature.

In this way, as in the flash pasteurisation process, it becomes possible to avoid the occurrence in fruit juices concentrated by means of it of the cooked flavour, which is objectionable.

In the process as applied to fruit juices it has been found necessary to make special provision for retaining certain volatile substances which affect the flavour of the finished product and which are removed during the course of evaporation. This is accomplished by the incorporation in the plant of a special device whereby these substances are trapped and condensed, thus permitting of their re-addition to the finished product.

In operation it is understood that after extraction of the juice some of the pulp may be removed by filtration or by treatment with enzyme in order to obtain a product that is not too viscous and difficult to handle. Such concentrated juices contain about 60 to 70 per cent. total solid matter and it is stated that they can be kept without change at ordinary amospheric temperature indefinitely. It is understood that the preparation of pure concentrated orange juice by the process is sometimes difficult by reason of the low acidity which affects the keeping properties and that a trade is in consequence springing up in mixtures of concentrated orange and lemon juices, the higher acidity of the lemon juice enhancing the keeping powers of the mixture.

The Concentration of Fruit Juices by the Method of Freezing.

This process depends on the application of the well-known principle that when a solution is cooled below the freezing point of water separation into two phases occurs, a solid phase consisting of pure ice crystals and a liquid phase consisting of the original solution in a more concentrated condition. Theoretically, therefore, it is possible to effect concentration to any desired degree by freezing the solution and then separating out the ice- crystals. The process has seen its most important commercial development in Germany, under the title of the Krause Process.

The process in its present form consists in double or treble freezing in a stationary condition, transferring the ice block to a centrifugal, removing the mother liquor by whizzing, and subsequently concentrating the mother liquor by the same means.

The juice is frozen in a special vessel of such a shape and size that the moulded block of frozen material exactly fits the centrifuge employed, the general shape of the juice space is an annular ring which tapers slightly from top to bottom. The vessel is immersed in a brine tank and the brine circulates outside and inside the ring of the container thus ensuring that the temperature gradient is horizontal, which causes the ice crystals to grow along this gradient and so facilitates the separation of the concentrate.

A framework is immersed in the liquid to be concentrated, which provides a means of handling the frozen block and helps to prevent the frozen mass from disintegrating. The remainder of the plant consists of the brine tanks in which the brine is specially circulated for freezing, a second brine tank in which after a certain period of freezing the cell is allowed to "temper" (whereby the temperature of the frozen mass becomes even throughout) and the centrifuge which is provided with a central pipe entering the bowl for the introduction of liquids to wash the ice mass. The whole plant is made of corrosion resistant alloys.

Two brine tanks are provided for freezing and one for tempering, there is one centrifuge, and auxiliary apparatus comprises refrigerating plant and thermostats with storage tanks.

In operation a cell is filled with juice and placed in the first freezing tank for an hour, it is then removed and placed in the tempering tank for an hour, which levels out the temperature throughout the mass. The cell is then plunged into

warm water and immediately the content is free it is lifted on its frame, placed in the centrifuge and spun until concentrate ceases to issue from the discharge pipe. The mass is then washed with original juice and then with ice water from previously discarded ice. The washings are used again and again until the solid content has been raised nearly to the level of the first concentrate. They are then added to the bulk.

The process on the second and third concentrations is similar, save that lower temperatures are employed, while the ice from the last concentration is not washed but is added as it is to the original juice.

A cell is filled every twelve minutes and put to freeze; during the interval cells due for centrifuging have to be handled; ice removed from the bowl at the end of washing, transfers made from freezing to tempering tanks, and filling of second and third concentration cells made. The work is stated to be capable of being carried out by four men.

It is stated that the juices produced are excellent in flavour, but to ensure their keeping it is required that the soluble solids-contents be raised to 60-65 per cent. by the addition of sugar. With this they will keep well for six months at a temperature of 50°C. This is not in complete accord with earlier claims reported for juices concentrated by this process. It is also stated that the removal of pectin from concentrated juice by the use of pectin destroying enzymes has been proposed, but it is not clear whether this is as yet actually incorporated in the process.

The Matzka Process.

The process seems to depend upon a combination of low temperature flash pasteurisation and metallic silver sterilisation, the liquid being passed in thin layers between two heated metal surfaces. The temperatures attained by the juices are, however, lower than those usually considered necessary for pasteurisation, actually temperatures of from 130—140°F. are employed, and the sterilising action is claimed to depend on the so-called oligodynamic action of the metal with which it is in contact. Moreover, the two metal surfaces are different and electrically insulated from one another so that some electrolytic action is supposed to take place. A certain amount of the metals goes into solution, and the possible effect of this on human health has been questioned.[1]

In its simplest form the apparatus consists of two concentric tubes, the inner one being of silver and the outer of stainless steel; heat can be applied to the inner surface of the inner tube and the outer surface of the outer tube while the juice under treatment flows through the space between the two tubes. Juice intended for treatment requires to be de-aerated as in ordinary flash pasteurisation, and may be treated with an enzyme or filtered to clarify it. After treatment, the juice is filled direct into bottles with suitable arrangements for sterilising them so as to prevent after-infection.

[1] In the opinion of the Ministry of Health the presence of small quantities of silver in juices treated by this process might be regarded as a contravention of the Public Health (Preservatives, etc., in Food) Regulations.

Various juices were treated experimentally in the Ontario trials and uniformly satisfactory results were reported. Among the juices treated were orange juice and grapefruit juice, and it is claimed that the products, as well as keeping satisfactorily, compared very favourably with commercial samples of similar juices which had been prepared by the ordinary flash pasteurisation process.

Commercial plants are stated to be operating in Holland, Sicily, Spain, the U.S.A. and Canada. It is stated that the National Research Council of Canada were satisfied that juices processed by this method had a superior and more natural flavour than any other processed fruit sampled.

Conclusion.

It is not altogether clear which of the processes of preserving citrus juices described offers the greatest prospect of success, i.e. (a) extraction of fresh fruit juice, its de-aeration and preservation by cold storage for short periods, (b) the preservation of fruit juice by flash pasteurisation and de-aeration followed by subsequent canning, (c) concentration of juice in vacuo by a film evaporation process, (d) concentration by freezing on the lines of the Krause process, or (e) preservation by the Matzka process.

The Krause process of concentration by freezing is thought by some to offer the best prospects in the long run. On the other hand, if the Matzka process fulfils its present promise it also seems to hold out possibilities, but the objection to this process by reason of the presence in the treated juice of small quantities of silver must not be overlooked.

The Department of Scientific and Industrial Research have pointed out that there is no possibility of patenting the actual process of concentration by freezing *per se*. The only points over which patent rights can extend are the details of the apparatus employed.

In conclusion, it may be pointed out that while the foregoing information applies in the first instance to the preservation of citrus fruit juices it also has a direct bearing on the preservation of juices of other kinds of fruit. In the Colonial Dependencies interest in this connection at present attaches particularly to the preservation of pineapple juice in Malaya and certain other Dependencies and to passion fruit juice in Kenya; consequently, although the application of the data given lies in the first place in those Dependencies in which citrus fruit is grown, it also has an interest for a number of others.

Review.

Report of the Poultry Technical Committee of Great Britain,

Published by H.M. Stationery Office, London 1938.

76 pp. Price 1 shilling net.

This Report is of more than passing interest to poultry keepers throughout the Empire and to those concerned with poultry improvement schemes by reason of the fact that breeders habitually procure their pedigree breeding stock from the United Kingdom and rely on the stamina of this stock to withstand and more trying conditions of their new environment. It comes somewhat as a shock, therefore, to read in this report of the great mortality of poultry experienced in Great Britain due to low vitality and stamina.

The reason for this unsatisfactory position is due in large measure to the rapid development of the industry in post-war years, the emphasis laid on egg numbers rather than stamina, and to certain unsatisfactory methods of marketing breeding stock. In other words, the high quality of the breeding stock has not been maintained in face of the expansion of the industry.

In consequence, the incidence of mortality has assumed serious proportions—the annual loss from disease is estimated to exceed £4,000,000 for adult laying birds in England and Wales alone.

The Committee recommends that steps be taken to stop the distribution of diseased and debilitated stock, the building up of good foundation stock, and closer control of breeding and sale of breeding poultry. These recommendations entail a considerable expansion in research work. The adoption of the recommendations will go far to restore confidence in the industry, but in any case it will take some time before the damage done can be eradicated and any considerable improvement effected in the position. In the meantime, poultry keepers in Malaya may feel themselves in a quandary as to where to obtain guaranteed good stock. The reviewer suggests that those who wish to import satisfactory stock from Great Britain should write to the Ministry of Agriculture in London, stating their requirements, and asking to be recommended to a source from which they can confidently rely on the high quality and stamina of stock. They may be assured that the Ministry is in a position to supply this information, and the result should therefore ensure that they are paying for stock with the desired characteristics.

D. H. G.

Departmental.

FROM THE DISTRICTS.

Compiled by the Chief Field Officer from Monthly Reports of Agricultural Officers.

October, 1938.

The Weather.

The weather generally has been dry. In Kedah and Penang although the rainfall was ample and well distributed the amount recorded was well below the averages of previous years. Throughout the west coast area the first half of the month was very dry but later the weather broke and good falls of rain were experienced in the latter two weeks. South Johore proved exceptional to this, for the rainfall there was normal.

For the last two months Pahang has experienced the rigours of a drought. On the east coast water supplies have everywhere been curtailed, and the condition of crops caused much anxiety. The dry weather continued into October, but showers of rain, which occurred in the last few days of the month, have helped to ameliorate conditions.

In Kelantan the month's rainfall was also below average, but was sufficient and evenly distributed.

Crop Reports.

Rubber.—The price of rubber has steadily appreciated, and reached a maximum of $37 per picul for best quality smoked sheet at the end of October. The price of coupons also reached a value of $30 per picul equivalent. Despite this increase of price there has been no greater activity among owners of rubber holdings. Those who employ labour to tap now definitely find that it pays them to sell their coupons and rest their trees. In Province Wellesley this state of affairs has become so general that there is now serious unemployment among Malays.

A report to the effect that the Kedah Government had decided that no new alienation of land should be made for planting rubber has caused much disappointment among people, there and in the Colony, who had been buying share certificates in the expectation of being allowed to plant new land. The value of share certificates has accordingly slumped to 80 cents. In other parts of the country the brisk trade in these certificates continues and the value is about $1 to $1.20 each.

In Kelantan dealers are paying a good premium for well prepared smoked sheet, and as much as $3.75 extra is being received. This is proving more effective than propaganda, and several smoke cabinets are being constructed.

Padi.—The floods which occurred in Kedah during September have caused serious damage. At Kubang Pasu in North Kedah 1,400 acres were destroyed. Fortunately there remained a fair quantity of surplus seedlings in nurseries in

neighbouring districts and these were brought to Kubang Pasu to replant the devastated areas. It is hoped that ultimately not more than 140 to 200 acres of the area destroyed will be left unplanted. The Kuala Muda District remained unscathed.

In the recently opened extension to the Sungei Acheh padi area, there has been some shortage of water, which has resulted in the plants being damaged by rats.

In Pahang, owing to the drought, the plight of padi planters in some areas has been desperate. In the Raub District some of the rice fields have been cultivated three times, but only after the recent showers is transplanting being attempted. Nurseries have also been sown two or even three times.

Despite these difficulties and misfortunes this season's crop in most parts of the country looks promising and, provided weather conditions are favourable, a fair yield is expected. The Agricultural Officer, Penang, reports that some areas on the Island now look so promising that the yields may well break records.

Coconuts.—Business in the copra market is very slack and not much of this commodity is being made. Owing to the fasting month the market for fresh nuts for eating is good and this is proving of financial benefit to small-holders.

Pineapples.—The scheme for the formation of a Central Board of Pineapple Packers was brought into operation during the month. Owners of unregistered factories who are also members of the Scheme are showing increased activity in carrying out renovations. The authorities are insisting upon strict compliance with hygienic requirements.

The basic price of canned pineapples was fixed by the Board at $3.10 per case of 48 cans of standard quality. Golden quality fruit is selling at $3.35 per case. Should this price be maintained it is expected that further attention will be given by canners to an increased output of this grade.

For the protection of their interests the formation of an association of growers, which has been decided upon, is proceeding.

Bananas.—In Negri Sembilan propaganda to induce banana growers to plant cover crops on their holdings has been continued, and some 20,000 cuttings of *Mikania scandens* have been distributed. Occupiers of 658 acres of banana land have now commenced to plant this cover. Among these growers it is a tenet that bananas must be clean-weeded; hence it is proving very difficult to induce them to carry out this measure which is very necessary for the prevention of soil erosion.

DEPARTMENTAL NOTES

Activities at the School of Agriculture, Malaya.

The second school term ended on 21st October.

The Commission appointed to report on higher education in Malaya visited the School on 7th November and conferred with the acting Adviser on Agriculture and the Principal of the School.

The third issue of the School Magazine has been published. It is attractively produced and contains some excellent articles and illustrations. The Editor and contributors are to be congratulated on the production of this publication which should serve as a valuable link between the School and the Old Boys.

School Gardens.

In many States, school garden competitions reached the final judging stage in October, the task of judging being shared by Agricultural Officers and officers of the Education Department. Schools have since closed for the "Bulan Puasa" holidays, and, unfortunately, many of the gardens will deteriorate before the pupils return.

Rural Lecture Caravan.

The Rural Lecture Caravan outfit visited 6 centres in the Sabak Bernam sub-District of Selangor during October, 2 days being spent at each centre. The subjects dealt with in agricultural lectures were copra, padi, poultry and plant propagation.

During the present year, the equipment has been operated from a lorry, as the caravan met with an irreparable accident early in January of this year. Arrangements have been made by the Propaganda and Marketing Committee for the provision and a new Lecture Caravan, to be operated by the Department of Agriculture, the Co-operative Department and the Rubber Research Institute of Malaya. It is anticipated that the new Caravan will be ready for use early in January 1939.

Leave.

Mr. J. Cook, Agricultural Officer, has been granted 245 days leave from 21st October 1938 to 26th June 1939 both days inclusive.

Mr. V. Dawson, Vice-Principal, School of Agriculture, has been granted 213 days leave from 5th November 1938 to 5th June 1939 both days inclusive.

Mr. R. G. H. Wilshaw, Chemist (Soils), has been granted 197 days leave from 13th August 1938 to 25th February 1938 both days inclusive, and not as previously stated, 274 days leave from 13th August.

Return to Duty.

Mr. C. L. Newman, Agricultural Officer, has assumed duty in the post of State Agricultural Officer, Selangor, on return from Sarawak where he was temporarily seconded for duty, with effect from 12th October, 1938, inclusive.

FERTILIZER PRICES, OCTOBER, 1938.

The following are the prices at the end of October, 1938, of some of the more important fertilizers.

Product.	Analysis				Price per ton $
	Nitrogen (N)	Phosphoric Acid (P_2O_5)		Potash (K_2O)	
		Soluble	Insoluble		
Sulphate of Ammonia ...	20.6	—	—	—	72.75
Calcium Cyanamide ...	20.6	—	—	—	80.00
Muriate of Potash ...	—	—	—	50	112.00
Sulphate of Potash ...	—	—	—	48	112.00
Superphosphate (concentrated) ...	—	39 - 40	—	—	105.00
Superphosphate ...	—	16 - 18	—	—	60.00
Basic Slag ...	—	16	—	—	48.00
Rock Phosphate (Christmas Island) ...	—	11*	38‡	—	33.50
Rock Phosphate (very finely ground Gafsa) ...	—	11*	26 - 28‡	—	40.00
Lime ...	—	—	—	—	20.00

* Citric soluble. ‡ Total

Quotations are *ex* warehouse, Port Swettenham, Klang, Singapore and Penang, with the exception of muriate of potash which is *ex* warehouse, Port Swettenham, Klang and Singapore.

The above quotations for concentrated superphosphate, superphosphate and Christmas Island phosphate are *ex* warehouse Penang, Port Swettenham and Klang. The Singapore quotations for these three fertilizers are $95, $50 and $31.50 per ton respectively.

Statistical.

MARKET PRICES.

October, 1938.

Major Crops.

Rubber.—The Singapore price of No. 1. X Rubber Smoked Sheet, loose, varied between 27¾ and 29¼ cents per lb., the average price for the month being 28.70 cents per lb., as compared with 26.21 cents per lb. in September. The highest and lowest London quotations were 8½ and 8⅛d. per lb., and New York 17⅛ and 16½ cents gold per lb. Average prices per lb. in London and New York respectively were 8.36d. and 16.83 cents gold as compared with 7.92d. and 16.04 cents gold respectively in September.

Prices paid for small-holders' rubber at three centres during October are shewn in Table I.

Table I.

Weekly Prices Paid by Local Dealers for Small-Holders' Rubber, October, 1938.

(Dollars per picul of 133 1/3 lbs.)

Grades	Kuala Pilah, Negri Sembilan				Kuala Kangsar, Perak			Batu Pahat, Johore.			
	6	13	20	27	5	12	19	5	12	19	26
Smoked Sheet	35.50	37.00	36.00	—	32.00	36.70	33.00	—	33.20	34.43	—
Unsmoked Sheet	34.00	35.00	35.00	34.00	—	—	—	33.30	32.58	33.54	32.28
Scrap	No purchases										

Transport by F.M.S.R. lorry service Kuala Pilah to Seremban 12 cents per picul, to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang $1 24 per picul, Seremban to Singapore $8.00 per ton.
Transport from Batu Pahat to Singapore by lorry excluding duty, 90 cents per picul.
Transport from Kuala Kangsar to Prai by railway $6.20 per ton.
Transport from Kuala Kangsar to Singapore by railway $10.00 per ton (minimum consignment 5 tons).
At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.
At Kuala Kangsar the standard deduction for moisture in unsmoked sheet is 10 per cent.
No purchases of rubber at Kuala Kangsar on 26th October.

Palm Oil.—Prices remained steady throughout the month. The average of weekly quotations per ton in September were:— palm oil £12.15.0, kernels £8.5.7½; prices for October are shewn in the following table:—

Table II.

Prices of Palm Oil and Palm Kernels.

Date 1938.	Palm Oil in Bulk, c.i.f. landed weight Liverpool/ Halifax. per ton	Palm Kernels, c.i.f. landed weight London/ Continent per ton
October 7	£ 13. 0. 0 Canada	£ 8. 3. 9 Rotterdam
,, 14	13. 0. 0 ,,	8. 3. 9 Continent
,, 21	13. 0. 0 ,,	8. 3. 9 ,,
,, 28	13. 0. 0 Liverpool	8. 5. 0 Rotterdam
Average	£ 13. 0. 0	£ 8. 4. 1

Copra.—Prices continued at a low level with a tendency to drop still lower. The average Singapore prices in October were as follows:— Sundried $3.12 and Mixed $2.78 per picul, as compared with $3.25 and $2.93 per picul respectively in September.

Copra cake remained steady at $2.05 per picul.

Rice.—The average Singapore wholesale market prices of rice per picul in September were as follows:— Siam No. 2 ordinary $4.46, Rangoon No. 1 $3.85, Saigon No. 1 $4.10, as compared with $4.34, $3.82 and $4.05 in August and $4.57, $3.92 and $4.12 in September 1937.

The average retail prices in cents per gantang were Singapore 29, Penang 35, Malacca 28.

The average declared trade value per picul of imports during September was $3.98, as compared with $4.00 in August and $4.20 in September 1937.

Padi.—Prices are generally higher in the main padi growing areas; in Kedah the price was per 100 gantangs $8.25 to $9, Penang $9.30, Perak North $11 to $12, Selangor $8.50 to $9, Malacca $9 to $10. Considerably higher prices rule in Districts more remote from centres of production.

The Government Rice Mill in Krian paid $2.30 per picul for padi. Other millers then raised their price to $2.45 to secure supplies which otherwise would have been diverted to the Government Mill.

Pineapples.—The Pineapple Packers' Agreement came into force on October 15th, and on 17th all Singapore factories closed down for stocktaking. Prices are still nominal. For G.A.Q. Spiral cut $3.10, Round cut $3.75, Cube $3.00 per case of 48 tins of 1⅓ lbs. each. Golden quality, Spiral $3.35, Round cut $4, Cube $3.25.

One factory in Selangor and 3 in Johore re-commenced working on limited supplies of fruit. In Selangor fresh fruit was from 70 to 80 cents per 100, Johore North, 1st quality $3, 2nd $2, and 3rd $1. In South Johore fresh fruit per 100 was 1st. $1 to $1.40, 2nd. 70 cents to $1, 3rd 40 to 70 cents. Singapore prices ranged per 100 from $1.20 to $1.70.

Beverages.

Tea.—Seven consignments of lowland tea comprising 454 packages were sold on the London market during October at an average price of 1s. 0d. per lb., in addition to 5 consignments (494 packages) of upland tea, which sold at an average of 1s. 2.15d. per lb.

According to the *Tea Brokers' Association of London Report* for October, the average London price per lb. realized during the month for consignments of tea from other countries were as follows:— Ceylon 1s. 3.18d., Java 1s. 4.20d., Indian Northern 1s. 2.58d., Indian Southern 1s. 1.47d., Sumatra 1s. 0.05d.

The latest Colombo average prices available, quoted from *The Ceylon Tea Market Report* of 25th October 1938, of the Ceylon Brokers' Association, are as follows, in rupee cents per lb.:— High Grown Teas 75, Medium Grown Teas 66, Low Grown Teas 62.

Coffee.—Sourabaya coffee prices in Singapore were steady at between $10.25 and $9.00 per picul, the price within this range depending on quality, while Palembang coffee prices averaged $12.44 to $10.89 per picul.

Liberian coffee appreciated to $14.75 per picul, the average price for the month being $14.69, Excelsa rose to $9.25, the average price being $9.19, and Robusta to $6.25, the average price being $6.19 per picul.

Spices.

Arecanuts.—The average of highest and lowest market prices in Singapore during October were as follows:— Splits $8.39 to $5.00, Red Whole $6.63 to $4.50, Sliced $11.52 to $8.37 as compared with $7.30 to $4.85, $6.68 to $5.19 and $8.80 to $7.10 respectively in September. The price within these ranges depends on quality.

The average of Singapore Chamber of Commerce quotations per picul were Best $8.19, Medium $7.75, Mixed $6.75 as compared with $8.15, $7.70 and $6.90 per picul in September.

Pepper.—Market featureless. Average Singapore prices per picul in October were:— Black $8.03, White $12.19, Muntok $12.70, as compared with $8.01, $12.45 and $12.70 in September.

Nutmegs.—Singapore prices declined steadily throughout the month. Both 110's and 80's were quoted at the same price, and averaged $29.50 per picul as compared with $30.60 per picul in the previous month. The Penang market price was $20 per picul.

Mace.—Singapore quotations for Siouw were $80 per picul, a nominal price. Amboina dropped $2 per picul, to average $61.50 per picul. Average prices in September were $80 and $62 per picul respectively. In Penang mace was quoted at $85 per picul.

Cloves.—Nominal prices for both Zanzibar and Amboina cloves were quoted in Singapore at $40 per picul. The Penang price was $42 per picul.

Cardamoms.—The latest available price for green cardamoms as given in *The Ceylon Chamber of Commerce Weekly Report* for 24th October 1938, was from 85 cents to Rs.1.15 per lb.

Miscellaneous.

Derris.—The position of the Singapore derris market, as reported last month, is unchanged, but prices have further declined. Average prices in October were:—for root sold on basis of ether extract $11 to $13 per picul, root sold on basis of rotenone content $18 to $20 per picul.

Our New York correspondent, writing on October 11th, reports that the market price for derris 5 to 6 per cent. rotenone is $5\frac{3}{4}$ to 6d. per lb. *c.i.f.* New York, based on landed weights and New York analysis on arrival. The premium for higher type root is about $\frac{1}{2}$d. per unit of rotenone content, but this is dependent on the percentage of total ether extractives. Cube root with a guaranteed 5 per cent. minimum rotenone content is fetching $8\frac{1}{2}$ cents (gold), or approximately $4\frac{1}{2}$d. Cube root, however, is liable to royalties under the Derris Patent which brings the cost to approximately $9\frac{3}{8}$ cents *c.i.f.* New York. It begins to appear that a greater proportion of derris root will be used this coming season as the price advantage of cube has shrunk markedly since last season and in some quarters derris dusts are preferred to cube. Generally speaking, however, the farmers regard them on a par.

Gambier.—Block gambier was quoted in Singapore at $7.00 per picul (nominal); Cube No. 1 $15 per picul, as compared with $7.25, and $15 respectively in September.

Tapioca.—Singapore prices have not moved from those reported for September, *viz.*: Flake Fair $4.10, Seed Pearl $3.90, Medium Pearl $4.50 per picul.

Sago.—Pearl sago was quoted in Singapore throughout October at $3.85 per picul, as compared with an average of $3.18 per picul in September. Flour Sarawak Fair dropped slightly to average $2.26 per picul, as compared with $2.29 in September.

Tobacco.—Prices continue to vary considerably from District to District. In the more important centres of production prices were generally higher. Uncured leaf was around $3 per picul. Prepared tobacco, Grade I, $31 to $45 per picul, Grade II $24 to $40, Grade III $11 to $30 per picul. Kelantan prices remain very much higher than the above quotations, while Johore prices continue discrimination between Javanese and Chinese tobacco, the latter fetching higher prices than the former.

The above prices are based on London and Singapore daily quotations for rubber, on the Singapore daily prices for copra, on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports and certain coffee prices are kindly supplied by Messrs. Guthrie & Co. Ltd., Kuala Lumpur, the Singapore prices of imported coffee and arecanuts by Lianqui Trading Company of Singapore, and Singapore derris prices by Messrs. Hooglandt & Co., Singapore.

1 Picul = $133\frac{1}{3}$ lbs. The Dollar is fixed at two shillings and four pence.

Note:—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57 Trafalgar Square, London, W.C. 2.

IMPORTATION OF FRESH FRUIT INTO CEYLON.

Representations were made to the Government of Ceylon asking that a licence may be issued in the form of a general authority to import fresh fruit from the Straits Settlements and Federated Malay States in view of the fact that the Mediterranean Fruit Fly does not occur in Malaya.

In reply, the Ceylon Government replied to the effect that licences to import fresh fruit are issued by the Director of Agriculture to importing firms and agencies on request, subject to the conditions laid down in the regulations. It will be necessary, therefore, for firms or agencies in Ceylon wishing to import fresh fruit from Malaya to apply for licences. In view of the fact that the Mediterranean Fruit Fly does not occur in Malaya, licences will be issued on receipt of applications.

The exports of fresh fruit from Malaya to Ceylon are very small—in 1937 they amounted to just over one ton, valued at $405, mostly mangosteens and rambutans —but in view of the fact that from time to time there is an excess of these fruits in the Penang market, this outlet for Malayan fruit is well worth consideration.

GENERAL RICE SUMMARY.*

September, 1938.

Malaya.—The imports of foreign rice during September were 68,891 tons,† exports were 18,876 tons, net imports being 50,015 tons as compared with 65,211 tons in August 1938 and 70,682 tons in 1937.¶

Of the September 1938 imports, 49 per cent. were consigned to Singapore, 15 per cent. to Penang, 6 per cent. to Malacca, 20 per cent. to the Federated Malay States and 10 per cent. to the Unfederated Malay States. The foreign imports by countries of origin were as follows, (in tons, percentages in brackets):—Siam 48,303 (70.1), Burma 17,192 (25.0), French Indo-China 2,294 (3.3), other countries 1,102 (1.6).

Gross imports for the first nine months of 1938 were 613,461 tons, exports were 145,567, net imports therefore being 467,894 tons.

Of exports during September, 82 per cent. were consigned to the Netherlands Indies and 18 per cent. to other countries. The various kinds of rice exported were as follows (in tons, percentages in brackets):—Siam 14,410 (76.3), Burma 3,846 (20.4), French Indo-China 548 (2.9), Parboiled 29 (0.2), Malayan 43 (0.2).

Net imports of rice during September by countries of origin were, in tons:—Siam 33,893, Burma 13,346, French Indo-China 1,746, elsewhere 1,030.

India and Burma.—Foreign exports January to August were 183,000 tons as compared with 625,000 tons in 1937, a decrease of 70.7 per cent. Of these 2.7 (4.2) per cent. were to the United Kingdom, 4.4 (6.1) per cent. to the Continent of Europe, 38.3 (28.0) per cent. to Ceylon, 4.9 (22.4) per cent. to the Straits Settlements and the Far East, and 49.7 (39.3) per cent. to other countries. The figures in brackets are for the same period of 1937.

Foreign exports from Burma from 1st January to 21st September 1938 were 2,512,613 tons as compared with 2,654,169 in 1937 a decrease of 5.3 per cent. Of the 1938 exports 41.0 (44.8) per cent. were to India, 10.1 (8.9) per cent. to the United Kingdom, 8.6 (11.1) per cent. to the Continent of Europe, 11.8 (10.9) per cent. to Ceylon, 14.2 (13.3) per cent. to the Straits Settlements and the Far East, and 14.3 (11.0) per cent. to other countries. The figures in brackets are for the corresponding period of 1937.

The average prices in rupee cents per 100 baskets of 75 lbs. each at Rangoon were:—Big Mills Specials 219, Small Mills Specials 232.

Siam.—Exports of rice and rice products from Bangkok during July were 112,496 tons. For the first seven months of 1938 exports were 931,205 tons as compared with 569,268 tons in 1937.

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* Abridged from the Rice Summary for September, 1938, compiled by the Department of Statistics, Straits Settlements and Federated Malay States.

† Ton = long ton (2,240 lbs.)

¶ It is to be understood throughout the Summary that all comparisons and percentage increases or decreases are in relation to the corresponding period of 1937.

According to a statement dated 30th September, 1938, received from His Majesty's Consul at Bangkok, relating to the final report on the rice crop of Siam for the season 1937-38, the cultivated area totals 8,424,948 acres, as compared with 8,145,440 acres of last season's crop. An increase of 279,508 acres in rice cultivation is shewn. About 1,066,474 acres are given as damaged area, as against 2,580,080 acres of that of the previous season. The harvested area is reported at 7,358,473 acres with an outturn of about 4,519,549 tons of paddy while the outturn of last season's crop was only 3,353,032 tons.

As a whole the present crop is much better than last season's crop, which, due to unfavourable weather conditions, was very much below normal. But if comparison is to be made of the present crop with some of the previous crops, the result could not be considered more than satisfactory.

As a comparison, statistics on rice crops from the season 1932-33 to the season 1936-37 are given below:—

Season	Area Planted Acres	Area Damaged Acres	Harvested Area Acres	Yields Tons
1932 - 33 ...	8,034,476	505,964	7,528,512	5,075,798
1933 - 34 ...	8,113,276	577,956	7,535,320	4,967,988
1934 - 35 ...	8,341,737	1,009,672	7,332,065	4,561,295
1935 - 36 ...	8,444,247	1,016,904	7,427,343	4,689,467
1936 - 37 ...	8,145,440	2,580,080	5,565,360	3,353,032
(Average 1932 - 36) ...	8,215,835	1,138,115	7,077,720	4,529,516
1937 - 38 ...	8,424,948	1,066,474	7,358,473	4,519,549

Japan.—The rice consumption in Japan (*Trans-Pacific Journal,* 22nd September, 1938) for the first 10 months of the present rice year, November-August, amounted to 9,823,282 tons, representing an increase of 145,021 tons over the corresponding period of the preceding rice year.

Stocks of rice on 1st September amounted to 2,377,555 tons, gaining 99,286 tons, or 4 per cent. over the corresponding period of last year.

The present rice year ends on 31st October. During the last two months, the rice supply is estimated at 2,648,387 tons as against a demand for 1,424,404 tons. The balance to be carried forward to the next season will be 1,223,983 tons.

The supply and demand figures are as follows:—

Supply:	tons	Demand:	tons
September 1st stocks ...	2,378,000	Estimated consumption ...	1,409,000
Estimated imports from abroad ...	11,000	Estimated exports abroad	1,000
,, ,, from colonies	259,000	Estimated exports to colonies	14,000
	2,648,000		1,424,000
Balance ...	1,224,000		

French Indo-China.—Entries of padi into Cholon during the first nine months of 1938 were 882,865 tons, as compared with 1,212,222 tons in 1937, a decrease of 27.2 per cent. Exports of rice during the same period were 920,499 tons, as compared with 1,206,758 tons in 1937, a decrease of 23.7 per cent.

His Majesty's Consul at Saigon states that the rise in the price of rice was uninterrupted from the 1st ($3.39 per picul) to 25th ($3.68 per picul). The price declined by the end of the month to $3.63, but a recovery is expected. The price of padi rose concurrently; opening at $2.23 per picul, it stood at $2.32 on 15th, and closed at $2.42 per picul.

Netherlands Indies.—The latest information available was published in the Summary for August 1938.

Ceylon.—Imports of rice for the first nine months of 1938 amounted to 418,750 tons, as compared with 400,581 in 1937, an increase of 4.5 per cent. Of these imports, 17.9 (17.0) per cent. were from British India, 69.7 (69.6) per cent. from Burma, 0.2 (0.1) per cent. from the Straits Settlements, and 12.2 (13.3) per cent. from other countries. The figures in brackets are for the corresponding period of 1937.

Europe and America.—Shipments from the East to Europe for the period 1st January to 8th September were 998,434 tons as compared with 892,956 tons in 1937, an increase of 11.8 per cent. Of these 40.5 (45.2) per cent. were from Burma, 48.9 (48.2) per cent. from Saigon, 9.3 (4.7) per cent. from Siam, and 1.3 (1.9) per cent. from Bengal. The figures in brackets are for the corresponding period of 1937.

Shipments to the Levant from 1st January to 25th August were 27,092 tons, as compared with 11,757 tons in 1937, an increase of 130.4 per cent.

Shipments for Cuba, West Indies and America from 1st January to 31st August were 144,225 tons, as compared with 191,444 tons in 1937, a decrease of 24.7 per cent.

MALAYAN AGRICULTURAL EXPORTS, AUGUST, 1938.

PRODUCT.	Net Exports in Tons				
	Year 1937	Jan./Aug. 1937	Jan./Aug. 1938	August 1937	August 1938
Arecanuts ...	30,084	20,494	26,383	656	2,679
Coconuts fresh ...	95,223†	59,205†	68,525†	5,796†	7,472†
Coconut oil ...	39,762	25,407	28,815	4,013	4,185
Copra ...	75,592	40,520	28,267	2,767	2,823
Gambier, all kinds ...	1,955	1,304	1,104	171	234
Copra cake ...	15,026§	9,507§	4,628§	1,487§	745§
Palm kernels ...	7,312	4,104	5,412	645	570
Palm oil ...	42,787	28,168	35,645	5,785	6,368
Pineapples, canned ...	80,502	64,589	55,038	8,723	5,349
Rubber ...	503,127¶	320,845¶	257,736¶	48,383¶	26,754¶
Sago,—flake ...	15,478	5,527	352	942	321*
,, —pearl ...	3,759	2,126	2,761	389	443
,, —raw ...	8,256*	4,775*	3,557	816*	316*
Tapioca,—flake ...	1,058	1,130	631	65	117
,, —flour ...	2,393*	1,328*	2,243*	247*	69*
,, —pearl ...	18,786	11,609	12,843	1,577	1,834
Tuba root ...	573	439	336	46	52

† hundreds in number. * net imports. ¶ production. § gross exports.

MALAYAN PRODUCTION OF PALM OIL AND KERNELS

(In long tons, as declared by Estates)

Month 1938	Palm Oil		Palm Kernels	
	F.M.S.	U.M.S.	F.M.S.	U.M.S.
January	2,241.7	1,309.2	383.7	232.0
February	2,040.4	1,457.1	370.4	261.0
March	2,359.6	1,843.1	446.8	344.0
April	1,963.7	1,122.6	353.6	218.0
May	1,491.7	1,480.7	274.8	258.0
June	1,773.5	1,781.2	315.9	247.0
July	2,546.5	2,134.2	450.8	311.0
August	3,587.4	2,798.1	587.8	437.0
September	3,415.9	1,779.2	591.4	289.0
Total ...	21,420.4	15,705.4	3,775.2	2,597.0
Total January to September, 1937 ...	19,973.5	13,439.5	3,547.4	2,176.4
Total for the year 1937 ...	27,733.5	17,932.8	5,094.7	2,811.4

Stocks on estates as at 30th September, 1938 were palm oil 1,885 tons, palm kernels 806 tons.

MALAYAN RUBBER STATISTICS

Acreages of Tappable Rubber actually Tapped and not Tapped on Estates of 100 Acres and over, for the Month ending 30th September, 1938.

State or Territory	Estimated Acreages of Tappable Rubber	Actual area tapped during the month Acreage	Percentage of (3) to (2)	Acreages of tappable rubber not tapped: Estates which have entirely ceased tapping — Acreage	Percentage of (5) to (2)	On estates which have partly ceased tapping: Otherwise than under rotational systems — Acreage	Percentage of (7) to (2)	Under rotational systems — Acreage	Percentage of (9) to (2)	Area of Tappable Rubber never been tapped — Acreage	Percentage of (11) to (2)	Total area not tapped (5) + (7) + (9)	Percentage of (13) to (2)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
S. S.—													
Province Wellesley ...	43,336	18,944	43.7	932	2.2	14,883	34.3	8,577	19.8	465	1.1	24,392	56.3
Malacca ...	121,610	55,778	45.9	3,847	3.1	32,095	26.4	29,890	24.6	1,678	1.4	65,832	54.1
Penang ...	2,488	1,187	47.7	nil	nil	1,241	49.9	60	2.4	18	0.7	1,301	52.3
Singapore ...	32,133	16,026	49.9	4,011	12.5	6,743	21.0	5,353	16.6	83	0.3	16,107	50.1
Total S.S. ...	199,567	91,935	46.1	8,790	4.4	54,962	27.5	43,880	22.0	2,244	1.1	107,632	53.9
F. M. S.—													
Perak ...	286,369	155,718	54.4	8,024	2.8	68,985	24.1	53,642	18.7	6,874	2.4	130,651	45.6
Selangor ...	323,234	194,122	60.1	7,074	2.2	58,037	17.9	64,001	19.8	6,704	2.1	129,112	39.9
Negri Sembilan ...	253,989	133,708	52.6	9,315	3.7	60,632	23.9	50,334	19.8	7,132	2.8	120,281	47.4
Pahang ...	86,290	45,967	53.3	3,613	4.2	26,137	30.3	10,573	12.2	6,269	7.3	40,323	46.7
Total F.M.S. ...	949,882	529,515	55.7	28,026	3.0	213,791	22.5	178,550	18.8	26,979	2.8	420,367	44.3
U. M. S.—													
Johore ...	475,605	269,709	56.7	18,150	3.8	120,421	25.3	67,325	14.2	32,138	6.8	205,896	43.3
Kedah ...	197,128	112,897	57.3	10,500	5.3	32,866	16.7	40,865	20.7	6,359	3.2	84,231	42.7
Kelantan ...	31,388	19,458	62.0	253	0.8	7,142	22.8	4,535	14.4	2,351	7.5	11,930	38.0
Trengganu (*b*) ...	4,817	3,182	66.1	nil	nil	74	1.5	1,561	32.4	74	1.5	1,635	33.9
Perlis (*c*) ...	1,371	621	45.3	262	19.1	354	25.8	134	9.8	75	5.5	750	54.7
Brunei ...	5,746	2,584	45.0	nil	nil	2,385	41.5	777	13.5	244	4.2	3,162	55.0
Total U.M.S. ...	716,055	408,451	57.0	29,165	4.1	163,242	22.8	115,197	16.1	41,241	5.8	307,604	43.0
Total Malaya ...	1,865,504	1,029,901	55.2	65,981	3.5	431,995	23.2	337,627	18.1	70,464	3.8	835,603	44.8

Notes:—(*a*) The acreage shown in column (11) is included in columns (5) and (7).
(*b*) Registered companies only.
(*c*) Figures for the quarter ending 30th June, 1938.

MALAYAN RUBBER STATISTICS Table I.

Acreage, Stocks, Production, Imports and Exports of Rubber, including Latex, Concentrated Latex and Revertex, for the Month of September, 1938 in Dry Tons.

State or Territory	Stocks at beginning of month 1			Production by Estates of 100 acres and over		Production by Estates of less than 100 acres estimated 2		Imports				Exports including re-exports				Stocks at end of month			Consumption 3	
								during the month		January to Sept. 1938		during the month		January to Sept. 1938						
	Ports	Dealers	Estates of 100 acres and over	during the month	Jan. to Sept. 1938	during the month	Jan. to Sept. 1938	Foreign	From Malay States & Labuan	Foreign	From Malay States & Labuan	Foreign	Local	Foreign	Local	Ports	Dealers	Estates of 100 acres and over	during the month	Jan. to Sept. 1938
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Malay States :—																				
Federated Malay States ...	...	7,008	18,053	10,177	99,317	2,826	44,241	Nil	Nil	Nil	Nil	10,663		109,036						
Johore ...	...	2,954	7,555	4,409	45,156	2,137	26,638	Nil	55	Nil	251	8,270	2,348	106,643	32,490	...	6,384	21,043	19	145
Kedah ...	...	218	4,418	2,358	24,388	410	7,531	Nil	Nil	Nil	Nil	2,311	2,977	26,490	43,367	...	3,074	8,748	...	...
Perlis ...	...	25	26	10	112	12	187	Nil	Nil	Nil	Nil	1,077	1,113	15,023	15,811	...	217	4,997	...	...
Kelantan ...	...	767	514	340	3,250	452	5,375	Nil	Nil	Nil	Nil	Nil	24	Nil	275	...	19	30	...	...
Trengganu ...	...	55	50	101	2,207	55	1,108	Nil	Nil	Nil	Nil	323	358	2,498	5,821	...	739	653	...	...
Brunei ...	...	10	59	42	409	44	588	...	...	...	...	5	151	5	3,310	...	55	50	...	...
Total Malay States	...	11,037	30,675	17,437	174,839	5,936	85,668	Nil	55	Nil	251	...	79	...	996	...	Nil	76	...	...
												14,379	7,050	153,052	102,070	...	10,488	35,597	19	145
S. Settlements :—																				
Malacca ...	...	2,103	1,808	932	9,779	779	4,823	Nil		Nil		2,277		21,190		...	1,986	2,066	...	...
Province Wellesley ...	...	3,224	757	348	3,642	154	*1,859	Nil		Nil		6,453		65,571		...	2,463	884	...	...
Penang ...	1,134	6,392	8	16	160	78	733	2,539	7,278	22,299	105,295		Nil		Nil					
Singapore ...	5,120	28,371	261	120	1,285	20	430	8,011		98,962		17,883		172,563		1,802	5,087	10	...	...
Labuan ...	...	49	Nil	Nil	Nil	11	106	36		415		Nil		Nil		3,739	24,770	288	26	223
Total Straits Settlements ...	6,254	40,139	2,834	1,416	14,856	1,042	7,951	10,586	7,278	121,676	105,295	26,613	Nil	259,324	Nil	...	33	Nil	...	...
																5,541	34,339	3,248	26	223
Total Malaya ...	6,254	51,176	33,509	18,853	189,705	6,978	93,619	10,586	7,333	121,676	105,546	40,992	7,050	412,376	102,070	5,541	44,827	38,845	45	368

*Amended:—89 tons over reported in May and 154 tons in August.

TABLE II
DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Federated Malay States	S'pore	Penang	Province We'sly D'dings M'cca.	Johore	Kedah
22	23	24	25	26	27	28
Dry Rubber	5,673	23,922	4,862	4,388	2,594	88
Wet Rubber	711	848	225	94	480	129
Total ...	6,384	24,770	5,087	4,482	3,074	217

TABLE III
FOREIGN EXPORTS

PORTS	For month	Jan. to Sept. 1938
29	30	31
Singapore ...	28,534	275,459
Penang ...	8,624	96,293
Port Swettenham.	3,755	38,769
Malacca ...	79	1,855
Malaya ...	40,992	412,376

TABLE IV
DOMESTIC EXPORTS 4

AREA	For month	Jan. to Sept. 1938
32	33	34
Malay States ...	18,927	252,145
Straits Settlements	1,425	21,597
Malaya ...	20,352	273,742

Notes:—

1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.
2. The production of estates of less than 100 acres is estimated from the formula: Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month, + Consumption, *i.e.*, Column [7] = Columns [13] + [14] + [17] + [18] + [19] + [20] − [2] − [3] − [4] − [5] − [9] − [10]. For the Straits Settlements the production of estates of less than 100 acres is represented by sales or exports as shown by cess paid.
3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15% wet sheet, 25% scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.
4. Columns (33) and (34) represent exports of rubber subject to regulation which, for Singapore and Penang Islands are represented by sales or exports as shown by cess paid.
5. All statements are brought up to date monthly, and any inaccuracies that may be disclosed are corrected in the totals; the latest publication therefore, is always the most reliable.
6. The above, with certain omissions, is the Report published by the acting Registrar-General of Statistics, S.S and F.M.S., at Singapore on 25th October, 1938

METEOROLOGICAL SUMMARY, MALAYA, SEPTEMBER, 1938.

Locality.	Air Temperature in degrees Fahrenheit							Earth Temperature		Rainfall								Bright Sunshine.		
	Means of			Absolute Extremes						Total.		Most in a day.	Number of days.					Total.	Daily Mean.	Per cent.
	A. Max.	B. Min.	Mean of A and B	Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	At 1 foot	At 4 feet			Amt.	Precipitation .01 in or more	Precipitation, .04 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more			
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.						hrs.	hrs.	
Railway Hill, Kuala Lumpur, Selangor ...	89.3	72.0	80.7	93	69	84	76	83.6	84.5	7.41	188.2	2.43	16	11	4	7	—	165.00	5.50	45
Bukit Jeram, Selangor ...	89.1	72.6	80.9	92	71	84	76	84.2	86.1	4.41	112.0	1.56	12	11	—	—	—	188.40	6.28	52
Sitiawan, Perak ...	87.9	72.8	80.3	91	68	81	76	83.8	84.7	9.00	228.6	2.25	13	11	3	—	—	143.80	4.79	39
Ipoh Aerodrome, Perak ...	89.2	72.2	80.7	93	68	84	75	82.8	84.0	5.58	141.7	1.01	17	14	6	—	1	153.10	5.10	42
Temerloh, Pahang ...	90.2	71.9	81.1	94	66	84	74	85.6	86.8	5.58	141.7	2.20	16	11	1	14	—	163.05	5.43	45
Kuala Lipis, Pahang ...	89.3	71.4	80.3	92	69	84	74	84.2	85.2	4.26	108.2	2.00	10	7	—	24	—	161.90	5.40	45
Kuala Pahang, Pahang ...	87.6	74.2	80.9	90	69	84	77	86.8	88.2	4.66	118.4	1.93	10	7	5	—	—	192.75	6.43	53
Kallang Aerodrome, S'pore ...	85.6	76.3	80.9	89	72	79	81	82.3	83.5	6.29	159.8	3.01	19	13	6	—	—	138.90	4.63	38
Bayan Lepas Aerodrome Penang ...	85.8	73.9	79.9	88	71	83	76	83.3	84.4	9.36	237.7	1.68	22	18	2	—	2	161.25	5.37	45
Malacca Town, Malacca ...	85.0	74.0	79.5	89	71	82	77	83.5	84.4	5.02	127.5	1.25	15	11	4	—	3	155.75	5.19	43
Kluang, Johore ...	87.5	71.3	79.4	91	66	80	73	81.3	82.2	7.55	191.8	1.44	15	14	6	11	—	127.25	4.24	35
Mersing, Johore ...	89.0	72.0	79.5	92	67	79	75	82.1	82.5	4.72	119.9	2.20	14	10	1	—	1	163.35	5.45	45
Alor Star, Kedah ...	86.3	73.7	80.0	90	72	80	76	84.2	85.2	13.62	345.9	2.61	21	18	2	—	—	146.90	4.90	40
Kota Bahru, Kelantan ...	88.5	73.7	81.1	92	71	84	76	84.2	85.1	12.35	313.7	2.46	18	15	3	—	1	169.60	5.65	46
Kuala Trengganu, Trengganu	88.8	72.9	80.9	92	71	85	76	83.9	85.3	3.52	89.4	0.96	17	10	2	—	1	176.10	5.87	49
Labuan ...	87.4	76.9	82.1	90	73	85	81	84.9	86.2	13.99	355.3	2.62	15	13	3	—	1	205.75	6.86	57
HILL STATIONS.																				
Fraser's Hill, Pahang 4268 ft.	73.5	61.9	67.7	77	60	68	64	72.3	72.9	5.79	147.1	1.23	21	15	5	12	2	155.85	5.19	43
Cameron Highlands, Tanah Rata, Pahang 4750 ft. ...	71.9	56.5	64.2	76	49	66	61	70.5	70.9	8.57	217.7	2.52	22	19	—	1	6	115.80	3.86	32
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft. ...	71.5	58.9	65.2	76	57	64	61	*	*	8.42	213.9	2.51	20	16	*	*	6	129.20	4.31	36

* Not recorded.